



# Kentucky Academic Standards (KAS) for Computer Science

## Progression Chart

Concept	Subconcept	<b>Grades K-5</b> By the end of Grade 5, students will be able to...	<b>Grades 6-8</b> By the end of Grade 8, students will be able to...	<b>Grades 9-12</b> By the end of Grade 12, students will be able to...
Networks & The Internet	Network Communication & Organization	<b>E-NI-01:</b> Understand the basic components of how networks operate to protect physical and digital information.	<b>M-NI-01:</b> Model how different sets of rules (protocols) are used to transmit different types of data across networks and the Internet.	<b>H-NI-01:</b> Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-NI-04:</b> Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). *
	Cybersecurity	<b>E-NI-02:</b> Standard 2: Model how information is broken down into smaller pieces (data packets), transmitted over various paths (physical and/or wireless), and reassembled at the destination	<b>M-NI-02:</b> Model how information is disguised using different methods of encryption to secure it during transmission from one point to another.	<b>H-NI-02:</b> Give examples to illustrate how sensitive data can be affected by viruses, malware and other attacks.
		<code>function moveForward() { var standard }</code>	<b>M-NI-03:</b> Explain how physical and digital security practices and measures proactively address the threat of breaches to personal and private data.	<b>H-NI-03:</b> Recommend security measures to address various scenarios based on factors such as usability, efficiency, feasibility, and ethical impacts.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-NI-05:</b> Compare ways software developers protect devices and information from unauthorized access. *
	Data & Analysis	Storage	<b>E-DA-01:</b> Appropriately store and modify digital files.	<b>M-DA-01:</b> Store data using multiple encoding methods.
Collection, Visualization & Transformation		<b>E-DA-02:</b> Standard 2: Collect and visually display data using appropriate applications.	<b>M-DA-02:</b> Collect data using computational tools and transform the data to make it more useful and reliable.	<b>H-DA-02:</b> Collect data using appropriate data collection tools and techniques to support a claim or to communicate information.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-DA-03:</b> Understand and design database structures to optimize search and retrieval.*
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-DA-04:</b> Explain the privacy concerns related to the collection and generation of data.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-DA-05:</b> Use data analysis tools (e.g. formulas and other software data / statistical tools) to process and transform the data to make it more useful and reliable.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-DA-08:</b> Create interactive data visualizations using software tools to help others better understand real-world phenomena.

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	Inference & Models		<b>E-DA-03:</b> Standard 3: Analyzing data for trends and relationships	<b>M-DA-03:</b> Refine computational models based on the data they have generated.	<b>H-DA-06:</b> Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-DA-07:</b> Create computational models that represent the relationships among different elements of data.	
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-DA-09:</b> Evaluate the ability of models and simulations to test and support the refinement of hypotheses.*	
Algorithms & Programming	Algorithms	<b>E-AP-01:</b> Create, follow, compare and refine algorithms for a task.	<b>M-AP-04:</b> Create flowcharts and/or pseudocode to address complex problems as algorithms.	<b>H-AP-07:</b> Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.	
			<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-AP-13:</b> Use and adapt classic algorithms to solve computational problems.*
			<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-AP-14:</b> Evaluate algorithms in terms of their efficiency, correctness, and clarity.*
			<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-AP-16:</b> Illustrate the flow of execution of a recursive algorithm.*
	Variables	<b>E-AP-02:</b> Standard 2: Explore and use variables in a program.	<b>M-AP-05:</b> Create clearly named variables that represent different data types and perform operations on their values.	<b>H-AP-03:</b> Use functions, data structures or objects to simplify solutions, generalizing computational problems instead of repeated use of simple variables.	
	Control	<b>E-AP-03:</b> Standard 3: Routinely create programs using a variety of tools to express ideas, address a problem or create an artifact, individually and collaboratively.	<b>M-AP-07:</b> Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.	<b>H-AP-06:</b> Justify the selection of specific control structures when trade offs involve implementation, readability, and program performance and explain the benefits and drawbacks of choices made.	
			<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-AP-15:</b> Compare and contrast fundamental data structures and their uses.*
			<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-AP-21:</b> Use version control systems, integrated development environments (IDEs), and collaborative tools and practices (code documentation) in a group software project.*
	Modularity	<b>E-AP-04:</b> Standard 4: Decompose precise steps needed to solve a problem.	<b>M-AP-02:</b> Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	<b>H-AP-05:</b> Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.	

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	<b>E-AP-05:</b> Use a process when creating programs or computational artifacts.	<b>M-AP-06:</b> Create procedures with parameters to organize code and make it easier to reuse.	<b>H-AP-18:</b> Analyze a large-scale computational problem and identify generalizable patterns that can be applied to a solution.*
Program Development	<b>E-AP-06:</b> Modify, remix or reuse part of an existing program to create a new program, giving attribution to others.	<b>M-AP-01:</b> Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.	<b>H-AP-01:</b> Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.
	<b>E-AP-07:</b> Standard 7: Document, share and reflect when creating programs using correct terminology.	<b>M-AP-12:</b> Develop a process creating a computational artifact that leads to a minimum viable product followed by reflection, analysis, and iteration.	<b>H-AP-02:</b> Use a development process in creating a computational artifact that leads to a minimum viable product followed by reflection, analysis, and iteration.
	<b>E-AP-08:</b> Standard 8: Identify and correct errors in an algorithm.	<b>M-AP-03:</b> Seek and incorporate feedback from team members and users to refine a solution that meets user needs.	<b>H-AP-04:</b> Design and iteratively develop event-driven computational artifacts for practical intent, personal expression, or to address a societal issue.
	<pre>function moveForward() { var standard }</pre>	<b>M-AP-08:</b> Incorporate existing code, media, and libraries into original programs, and give attribution.	<b>H-AP-08:</b> Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
	<pre>function moveForward() { var standard }</pre>	<b>M-AP-09:</b> Systematically test and refine programs using a range of test cases.	<b>H-AP-09:</b> Evaluate and refine computational artifacts to make them more usable and accessible using systematic testing and debugging.
	<pre>function moveForward() { var standard }</pre>	<b>M-AP-10:</b> Document programs in order to make them easier to follow, test, and debug.	<b>H-AP-10:</b> Systematically design and develop programs for broad audiences by incorporating feedback from users.
	<pre>function moveForward() { var standard }</pre>	<b>M-AP-11:</b> Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.	<b>H-AP-11:</b> Design and develop computational artifacts working in team roles using collaborative tools.*
	<pre>function moveForward() { var standard }</pre>	<pre>function moveForward() { var standard }</pre>	<b>H-AP-12:</b> Describe how artificial intelligence drives many software and physical systems.*
	<pre>function moveForward() { var standard }</pre>	<pre>function moveForward() { var standard }</pre>	<b>H-AP-17:</b> Construct solutions to problems using student-created components, such as procedures, modules and/or objects.*
	<pre>function moveForward() { var standard }</pre>	<pre>function moveForward() { var standard }</pre>	<b>H-AP-19:</b> Select and employ an appropriate component or library to facilitate programming solutions.*
<pre>function moveForward() { var standard }</pre>	<pre>function moveForward() { var standard }</pre>	<b>H-AP-20:</b> Develop programs for multiple computing platforms.*	
			<b>H-AP-22:</b> Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., introducing errors).*

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		Program Development	<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-AP-24:</b> Compare multiple programming languages and discuss how their features make them suitable for solving different types of problems.*
Impacts of Computing	Culture	<b>E-IC-01:</b> Standard 1: Discuss how computing has impacted society.	<b>M-IC-01:</b> Discuss issues of bias and accessibility in existing technologies.	<b>H-IC-01:</b> Reduce bias and equity deficits through the design of accessible computational artifacts.
		<code>function moveForward() { var standard }</code>	<b>M-IC-02:</b> Compare the positive & negative effects of computing technologies on society.	<b>H-IC-03:</b> Research how computational innovations that have revolutionized aspects of our culture might have evolved from a need to solve a problem.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-IC-06:</b> Evaluate the impact of the digital divide (i.e. inequity of computing access, education and influence) on the development of local communities and society.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-IC-07:</b> Demonstrate ways computational design (i.e. algorithms, abstractions and analysis) can apply to problems across disciplines.*
	Social Interactions	<b>E-IC-02:</b> Standard 2: Discover how computing devices have affected the way people communicate.	<b>M-IC-03:</b> Collaborate with others using appropriate tools at the local, national, and/or international levels.	<b>H-IC-02:</b> Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.
	Safety, Law & Ethics	<b>E-IC-03:</b> Standard 3: Evaluate the relevance and appropriateness of electronic information sources and digital media.	<code>function moveForward() { var standard }</code>	<b>H-IC-04:</b> Explain the beneficial and harmful effects that laws governing data (intellectual property, privacy etc.) can have on innovation.
		<b>E-IC-04:</b> Standard 4: Understand the importance of proper use of data and information in a computing society.	<code>function moveForward() { var standard }</code>	<b>H-IC-05:</b> Evaluate and design computational artifacts to maximize their benefit to society.*
		<code>function moveForward() { var standard }</code>	<b>M-IC-04:</b> Discuss the benefits and consequences of making information either public or private.	<b>H-IC-08:</b> Debate laws and regulations that impact the development and use of software and the protection of privacy.

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Computing Systems	Devices	<b>E-CS-01:</b> Select and operate appropriate software and hardware to perform a variety of tasks and recognize that users have different needs and preferences for the technology they use.	<b>M-CS-01:</b> Recommend improvements to the design of computing devices based on an analysis of how users interact with the devices.	<b>H-CS-01:</b> Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.
	Hardware & Software	<b>E-CS-02:</b> Identify and describe the function of common physical components of computing systems (hardware) using appropriate terminology.	<b>M-CS-02:</b> Design projects that combine hardware and software components to collect and exchange data.	<b>H-CS-02:</b> Compare levels of abstraction and interactions between application software, system software and hardware layers.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-CS-04:</b> Categorize the roles of operating system software.
		<code>function moveForward() { var standard }</code>	<code>function moveForward() { var standard }</code>	<b>H-CS-05:</b> Illustrate ways computing systems implement logic, input, and output through hardware components.*
	Troubleshooting	<b>E-CS-03:</b> Describe basic hardware and software problems using accurate terminology.	<b>M-CS-03:</b> Identify and fix problems with computing devices and their components systematically.	<b>H-CS-03:</b> Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.